United Nations A/AC.259/13

General Assembly

Distr.: General
22 April 2005

Original: English

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea
Sixth meeting
6-10 June 2005

Note verbale dated 18 April 2005 from the Permanent Mission of Costa Rica to the United Nations addressed to the Secretary-General

The Permanent Mission of Costa Rica presents its compliments to the Secretary-General, and has the honour to refer to the sixth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea.

The Permanent Mission of Costa Rica is honoured to convey to the Secretary-General the document entitled "The bottom line: an investigation of the economic, cultural and social costs of industrial longline fishing in the Pacific and the benefits of sustainable use of marine protected areas", to be used as one of the background papers of the forthcoming meeting of the Consultative Process (see annex). The Government of Costa Rica is convinced that the information and the recommendations contained in the document will provide a valuable input to the consideration of the question "Fisheries and their contribution to sustainable development" at the forthcoming meeting of the Consultative Process.

The Permanent Mission of Costa Rica would be grateful if the present note and its annex would be issued as a document of the Consultative Process.

05-31980 (E) 250505

Annex to the note verbale dated 18 April 2005 from the Permanent Mission of Costa Rica to the United Nations addressed to the Secretary-General

The Bottom Line: An investigation of the Economic, Cultural and Social Costs of Industrial Longline Fishing in the Pacific and the Benefits of Sustainable Use of Marine Protected Areas[1]

With Recommendations for Action

By Robert Ovetz, Ph.D., Sea Turtle Restoration Project

Mounting scientific evidence has documented the extensive damage caused by high seas industrial longline fishing in the Pacific to the marine ecosystem. What has received less attention is that industrial longline fishing also has extensive negative economic and social consequences for coastal communities and the nearly 1 billion people that rely on fish for their primary source of protein.

The impact of high seas longline fishing in the Pacific, which consists of the largest tuna fishery in the world, can be felt throughout our planet. Sea turtles, seabirds, marine mammals and other threatened marine species are caught, injured and killed by industrial longlines in large numbers and pushed to the edge of extinction. Industrial longline fishing not only threatens marine wildlife but human societies that rely on the ocean for their own well-being.

A recent investigation has found that pelagic longline fishing may be contributing to the depletion of local fish stocks, thereby threatening the food security of coastal communities primarily served by small-scale "artisanal" fishermen and women.[2] Additional recent scientific studies have identified industrial longlining as the cause of the decline in the population of large pelagic fish species including billfish, sharks and tuna by as much as 87-99 percent in the Atlantic, Gulf of Mexico and the Atlantic since the 1950s.

The modest profits of medium and large-scale industrial longline fishing are negated by hidden costs generated by massive government and intergovernmental subsidies, risk of fishery collapse, damage to small-scale fishing, threats to local food security, losses to indigenous island cultures integrally connected to sea turtles, sharks and the ocean, damage to local marine ecosystems, and harm to more lucrative sustainable economic activities such as sportfishing, tourism, whale watching and diving. Smallscale fishermen are finding their fisheries depleted by foreign industrial-scale vessels encouraged by heavy subsidies; local seafood consumers face rising prices and shortages, and native peoples are losing their traditional fishing grounds. When the industrial longline vessels deplete the local fisheries and move their operations that once provided a payoff to individual nations, local communities are left with the crisis of trying to feed their families and communities from badly damaged marine ecosystems. This damage to local

coastal communities is being carried out to catch fish that are primarily exported to markets in wealthy countries in Europe and North America well as Japan.

The benefits of conservation to both developed and developing countries are immense. Recent studies have shown that sustainable use Marine Protected Areas (MPAs)[3] that prohibit industrial fishing are extremely successful in replenishing the biological diversity of both target and non-target marine species in a period of 1-5 years and for less than the cost of subsidizing industrial fisheries. Because developing countries are home to the overwhelming majority of sea turtle populations, for example, these countries have the most to gain from protecting the species. In fact, a number of communities in developing countries home to sea turtle nesting habitats have profited from successful efforts to conserve sea turtle populations through enhanced eco-tourism.

MPAs are a valuable tool for fisheries management because they allow local control of the marine food supply. This ensures that these resources are not drained away from the local communities merely to be exported abroad for short-term profit.

On the other hand, aside from shouldering the cost of subsidizing a marginally profitable and inefficient longline industry, developed nations must also pay the costs to public health from mercury contaminated longline caught tuna, shark and swordfish.

The crisis caused by longline fishing is a case example of the systemic damage being done by unregulated industrial fishing in a newly emerging, increasingly unregulated global economy in which nations are encouraged to exhaust our shared ocean to generate commodities for export to wealthy markets. Industrial longline fishing is a case example of a destructive fishing practice which the United Nations General Assembly, World Summit on Sustainable Development, Convention on Biological Diversity, the United Nations Millennium Ecosystem Assessment Synthesis Report, and two consultative committees of the UN Food and Agriculture Organization (FAO) in addition to about 900 scientists from 83 countries and 230 nongovernmental organizations from 54 countries have recommended to be prohibited.

I. The Impact of Industrial Longline Fishing on Marine Biodiversity

Pelagic longline fishing in the Pacific is a highly unselective fishing technique that uses monofilament lines at the shallow surface of the high seas stretching as much as 60 U.S. miles with as many as thousands of baited hooks. These large vessels originate from a number of countries including the U.S., Japan, Taiwan, Spain and other Asian and Latin American countries and primarily export their catch to the U.S., Japan and the European Union. Targeting highly migratory predatory fish species including tuna and swordfish, industrial longlines also catch or kill as many as 4.4 million sea turtles, billfish, sharks, marine mammals and seabirds.[4]

Most threatened by industrial longline fishing are leatherback sea turtles which migrate thousands of miles across the Pacific to lay their eggs, feed and reproduce. According to recent scientific reports, the number of nesting female Pacific leatherback sea turtles has declined by 95 percent since 1980 and is expected to go extinct within the next 5-30 years unless efforts are taken to reverse their decline.[5] One of the largest threats to their survival is pelagic industrial longline fishing. Leatherback sea turtles get hooked on longlines and often drown before the line is reeled and the sea turtle can be released.

Longlines are also one of the main threats to the survival of sharks and billfish. Recent studies have documented the rapid decline of large predatory fish species such as billfish, sharks and tuna. In the Pacific, the biomass of large predatory fish caught by longline fishing, for example, has declined by 90 percent since 1950.[6] Earlier this year, the U.S. warned that albacore and bigeye tuna, also caught with longlines, are being overfished in the Pacific. The problem is not restricted to the Pacific. A recent report has found that industrial longline fishing has contributed to the decline of oceanic whitetip and silky shark species by 90-99 percent in the Gulf of Mexico.[7] Another scientific study showed that in the Atlantic "large predatory fish biomass today is only about 10 percent of pre-industrial levels."[8]

Longlines are also a significant threat to species of seabirds that are often caught on longline hooks on the high seas. Reports have documented that longline fishing is one of the main threats to the survival of the highly endangered Black-footed albatross in the Pacific. The latest estimates indicate that between 5,000 to 13,800 Black-footed Albatross (1.9 to 5 percent of the population) are killed each year by industrial longline fishers with additional birds killed by other types of fishing and pollution.[9] According to a recent report, 19 of the 21 species of albatross are now considered globally threatened with the remainder classified as near threatened.[10] Longlines are the most significant threat to these species' survival.

II. The Economics of Longlining

The combination of high subsidies, historically declining catches, high fuel costs and other factors make longlining unsustainable, inefficient and unprofitable to most fishers.

A. Subsidies Obscure the True Costs of Longlining

Globally, governments are estimated to subsidize fishing at a rate of 20-25 cents for every dollar earned by fishermen. Members of the Organization for Economic Cooperation and Development (OECD) plus China account for approximately 75 percent of the $14-$20 billion[11] in subsidies that are doled out each year. This estimate may be extremely low, as the UN Food and Agriculture Organization (FAO) found in 1993 that such subsidies may amount to as much as

$50 billion.[12] The European Union and its member states provide an estimated $1.5 billion in annual subsidies, Japan close to $3 billion, and the United States $868.43 million, $150 million of which consists of tax rebates on marine diesel fuel.[13] In all, an estimated $2.5 billion per year is pumped into the multi-national North Atlantic fleets alone.[14] According to the UN Food and Agriculture Organization, worldwide fishing revenue amounted to only $70 billion while total operating costs totalled $85 billion.[15]

As we will see, a significant proportion of the U.S. longline fleet has been unprofitable in recent years. An even larger portion would have been unprofitable without the government subsidies that cushion potential losses. Such losses do not include additional significant direct and external costs to the ocean ecosystem and coastal communities that rely upon it.

B. Longlining is Unprofitable

New technologies and increased fishing effort are not necessarily leading to higher profits in the longline fishery. In fact, according to a study of the worldwide impacts of longline fishing, U.S. and Canadian "longline fisheries emerge as a marginally profitable industry that, in some regions, target species that are considered endangered or vulnerable by the IUCN."[16] Longline fishing methods are flooding the market with high quantities of relatively low quality fish which drives down prices and reduces profit. For example, the longline fleet in the Indo-Pacific is flooding Japan with low-grade tuna, causing prices to decrease while continuing to take relatively large numbers of tuna from the ocean.[17] As a result, the price for swordfish has been declining because the market is flooded by swordfish from the Caribbean, South America, Australia, Canada, Spain and the Western Pacific.

There has been an ongoing conflict between Chile and the European Union since 2000, when the Chilean government closed its waters to Spanish industrial longline vessels that had depleted Chile's swordfish stocks and depressed take by local fishers. Chile was merely a transit station for the bulk of the catch on its way to lucrative U.S. and Japanese markets. In retaliation, the EU threatened Chile with action at the WTO forcing it to back down and reopen its waters to the EU until 2002 when it refused to renew its lease agreement. This case went to the International Tribunal for the Law of the Sea but was eventually suspended by both parties as a result of a new trade pact.

Longline swordfishing is often only marginally profitable, if profitable at all. A study of 95 vessels in the Hawaiian longline fleet in 1993 found that 32, or one third of the vessels, realized a negative return, when amortization of the vessels was included.[18] Overall, longline vessels targeting swordfish had the lowest average annual profit, $11,000, while longline vessels targeting tuna and mixed species earned $20,000 and $47,000 per year, respectively. In fact, 48 percent of the swordfish vessels lost money that year. The total revenues for 1993 were $55 million. Because the analysis did not include subsidies, rebates, tax write-offs,

docks constructed at public expense, and costs for training and marketing, this estimate should be considered conservatively low. A 2005 study of 20 Hawaii based longline vessels found an average loss of $39,897 per vessel. If these vessels had remained in California, where they temporarily relocated from 1999-2004 after being banned in Hawaii, they would have had an average loss of $100,164 per vessel.[19] Another study of longlining in the Atlantic and Gulf of Mexico found that full-time longline vessels lost on average a total of about $3,500 per year and part-time longline vessels lost $23,500 per year, although these losses may not be apparent due to subsidization of the longline fishery.[20]

Figure 1: Profitability of Longline Fishing in the Atlantic and Gulf of Mexico (U.S. dollars)

Revenue	Variable Costs	Fixed Costs	Depreciation	Other Fishing Income	Profit F/T*	Profit P/T**
$250,000	$190,000	$50,000	$17,000	$3,500	—$3,500	—$23,500

Notes:

* "F/T" refers to full-time

** "P/T" refers to part-time

• All figures are averages

Source: Porter, R. M., Wendt, M., Travis, M. D., and I.E. Strand, "Cost-earnings study of the Atlantic-based U.S. pelagic longline fleet," unpublished paper, SOEST 01-02, JIMAR Contribution 01-337, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 2001; and Dumas, C., "The economics of pelagic longline fishing in the U.S. and Canada—A brief overview," presentation notes submitted at the International Leatherback Survival Conference, April 22-25, 2002, p. 11.

C. Longlining Is Inefficient and Wasteful

Since the mid 1970s oil crisis, the amount of fuel consumed by larger and larger vessels has been rapidly outpacing the growth in the actual catch. A recent study explored the energy efficiency of a number of world fisheries, including longlining, and found longlining to be the second most inefficient industrial fishery.[21] Taking into account the material and petroleum required to power a wide variety of industrial fishing vessels, the study compared the amount of edible protein in the catch. According to the study, amongst fisheries targeting high value species, "it is now common for direct fossil fuel energy inputs alone to exceed nutritional energy embodied in the catch by at least an order of magnitude." In an earlier preliminary study of 54 North Atlantic fisheries from five countries, the

author uncovered a wasteful paradox: "the availability of abundant energy enables most contemporary fisheries to continue even when stocks are in decline."

Among the fisheries with the most inefficient "edible protein return on investment," vessels targeting shrimp, tuna and swordfish are at the top of the list. By comparison, it is relatively fuel-efficient to target deep sea species such as menhaden and mackerel, most of which are ground up into meal or used for oil for unsustainable fish farms.

Tuna and swordfish fisheries are especially petroleum hungry, with energy consumption three times the average. Between 1986 and 1999, the amount of energy consumed by these fisheries skyrocketed fourfold. Of the 32 demersal, pelagic and shellfish fisheries studied, the Central Pacific swordfish/tuna longline fishery had the fourth highest "fuel use intensity" (liters of fuel per ton of catch), and the tuna/billfish longline fishery had the highest—exceeding even that of shrimp trawling, the second highest. As a result, these two industrial longline fisheries are among the eight lowest in terms of "edible returns on investment" for protein.[22]

Figure 2: Energy Performance of Industrial Fisheries for Direct Human Consumption

	Main Fishery Targets	*Gear*	*Time Frame*	*Location of Fishery*	*Fuel Use Intensity (litres/tonne)*	*Edible Protein EROI*
Demersa	Redfish spp.	Trawl	Late 1990's	North Atlantic	420[A]	0.11
	Cod/Flatfish spp.	Danish seine	Late 1990's	North Atlantic	440[A]	0.10
	Cod/Haddock	Longline	Late 1990's	North Atlantic	490[A]	0.091
	Cod/Saithe	Trawl	Late 1990's	North Atlantic	530[A]	0.084
	Alaskan Pollock	Trawl	Late 1980's	North Pacific	600[B]	0.052
	Flatfish spp.	Trawl	Late 1980's	NW Pacific	750[B]	0.066
	Croakers	Trawl	Late 1980's	NW Pacific	1,500[B]	0.029
	Flatfish spp.	Trawl	Late 1990's	NW Atlantic	2,300[A]	0.019
Pelagic Fisheries	Herring/Mackerel	Purse seine	Late 1990's	NE Atlantic	100[A]	0.56
	Herring	Purse seine	Early 1990's	NE Pacific	140[C]	0.36
	Herring/Saithe	Danish Seine	Late 1990's	NE Atlantic	140[A]	0.35
	Salmon spp.	Purse seine	1990's	NE Pacific	360[C]	0.15
	Salmon spp.	Trap	Early 1980's	NW Pacific	780[B]	0.072
	Salmon spp.	Gillnet	1990's	NE Pacific	810[C]	0.068
	Salmon spp.	Troll	1990's	NE Pacific	830[C]	0.067
	Herring	Purse seine	Early 1980's	NW Pacific	1,000[B]	0.051
	Skipjack/Tuna	Pole and line	Early 1980's	Pacific	1,400[B]	0.053
	Skipjack/Tuna	Purse seine	Early 1980's	Pacific	1,500[B]	0.049
	Swordfish/Tuna	**Longline Late**	**1990's**	**NW Atlantic**	**1,740[A]**	**0.042**
	Salmon spp.	Gillnet	Early 1980's	NW Pacific	1,800[B]	0.031
	Swordfish/Tuna	**Longline**	**Early 1990's**	**Central Pacific**	**2,200[D]**	**0.027**
	Tuna/Billfish	Longline	Early 1980's	Pacific	3,400[B]	0.022
Shellfish	Abalone/Clams	Hand gathering	Early 1980's	NW Pacific	300[B]	0.11
	Crab	Trap	Late 1990's	NW Atlantic	330[A]	0.057
	Scallop	Dredge	Late 1990's	North Atlantic	350[A]	0.027
	Shrimp	Trawl	Late 1990's	North Atlantic	920[A]	0.058
	Shrimp	Trawl	Early 1980's	North Pacific	960[B]	0.056
	Norway Lobster	Trawl	Late 1990's	NE Atlantic	1,030[A]	0.026
	Crab	Trap	Early 1980's	NW Pacific	1,300[B]	0.014
	Spiny Lobster	Trawl Early	1980's	NW Pacific	1,600[B]	0.017
	Squid	Jig	Early 1980's	NW Pacific	1,700[B]	0.033
	Shrimp	Trawl	Late 1990's	SW Pacific	3,000[D]	0.019

Notes:

* Higher fuel use intensity implies lower energy efficiency
* Bold added

Source: Reprinted with permission from P. Tyedmers, "Fisheries and energy use", prepublication draft, C. Cleveland (ed.) Encyclopedia of Energy, Academic Press/Elsevier Science, vol. 2, 2004, p. 12.

The issue of fuel inefficiency is the consequence of larger systemic developments directly correlated to spiralling expansion of the industrial longline industry. Since the late 1980s, the expansion of the industrial longline fishery has created a damaging feedback loop both for the marine ecosystem and the societies that rely on pelagic species for their livelihoods. As longline and industrial fishing technology developed, it allowed a rapid expansion of fishing capacity that far exceeded the reproductive capacity of the targeted fish stocks. This created a feedback loop that drove industrial longline fleets to go farther from shore to catch dwindling stocks. At the same time, decreasing catches forced small-scale fishermen to increase the size of their vessels and fish farther from shore. Encouraged by a wide range of subsidies and access to lucrative foreign export markets, many of these fleets descended deeper into debt to finance an expansion of capacity to chase fewer and fewer fish farther and farther from shore.

Longlining is also a major contributor of climate warming carbon dioxide gases. The fisheries in this study consumed a staggering 1 billion liters of diesel fuel, each liter of fuel producing 2.66 kilograms of CO2. The very small island nations that rely on meager royalties from the foreign longline catch in their EEZ are caught in a paradox. Threatened by rising sea levels from global climate change, they rely heavily on royalties from an industry that is a significant contributor of CO2 responsible for creating climate change.

D. The Costs of Bycatch

Bycatch and overfishing impose significant costs on the oceans and society, most of which are not directly borne by the fishers themselves. It is estimated that global commercial fisheries generate roughly 44 billion pounds of wasted catch each year, including over 3 billion pounds by U.S. fishermen alone.[23] Bycatch is both a problem for target as well as non-target species.

Two kinds of bycatch plague a vessel. First, fishers catch and kill marine life that has little or no market value. Second, fishers catch commercially valuable fish that do not meet legal minimum size and weight requirements or exceed catch quotas. In both cases, this waste is not included in estimates of the total operating costs or the price of fish, except to the extent that extra time is required to free or dispose of the bycatch, repair damaged nets and lines and empty nets otherwise crowded with unwanted species. In effect, the estimated "cost" attributed to bycatch includes only the time and equipment it takes to remove unwanted animals from nets, lines and boats.

We have yet to manage our fisheries to take into account the social and ecological costs of removing such a significant part of our marine biodiversity as so-called incidental bycatch. This portion of bycatch costs alone can be significant, especially in the longline fishery. The rate of bycatch in the Atlantic longline fleet, for example, was found to be one-half of the total catch.[24] Many regional fisheries councils and national governments inadequately report bycatch or do not have

observers aboard to monitor let alone require fishers to implement bycatch mitigation gear or strategies.[25]

As a result, much of the swordfish caught is classified as so-called "bycatch." According to Crowder and Myers, "swordfish is such a common catch on tuna-targeted trips that about 50 percent of the total swordfish catch is taken as bycatch, not as targeted catch. In fact, the swordfish caught by the world's leading swordfish harvesters—Japan and Taiwan—is primarily bycatch from tuna fisheries."[26] In effect, the value of the bycatch fish may exceed the targeted fish. It is estimated that more swordfish is caught by tuna longlines in the Pacific than longlines targeting swordfish and that such bycatch amounts to about 25 percent of the global catch.[27]

Bycatch has extensive negative consequences on both the economy and biodiversity. Sportfishers, divers, and other humans who live and work with billfish, sea turtles, seabirds, marine mammals and other species caught as bycatch are harmed directly, often with direct economic consequences. Bycatch destroys both predatory and prey species upon which complex ecosystems rely for survival, the long-term consequences of which we are only now beginning to ascertain. For example, the reduction in leatherback sea turtles, which feed almost exclusively on jellyfish due to longline fishing has paralleled extensive jellyfish blooms. These blooms result in beach closings, damage to fisheries and the loss of tourism revenues.

III. The Negative Impact on the Economy

Longline fishing supplies a luxury item for wealthy markets in the U.S., EU and Japan that makes an insignificant contribution to the local and global economy while creating extensive external costs from the ecological and social damage. The U.S. is a good example of this widening gulf between the costs and benefits of longlining. In Hawaii, the total value from industrial longliners was $47.4 million in 1999, a decline from $53.4 million in 1993.[28] An estimated additional $101 million in regional personal income from value-added processing, distribution, wholesaling and retailing likely was generated.[29] This $141 million comprises only a small fraction of the total Hawaiian economy. In contrast, the overall Hawaiian state economy in that year was approximately $40 billion, meaning that this industry is a mere one-thousandth (0.1 percent) of the state's economy. Globally, the longline fishery is estimated to be valued at $4-$5 billion in dockside value and the annual South Pacific tuna fishery is estimated to be valued at $2 billion.[30]

In addition to longline fishing contributing a small part of the U.S. West Coast's overall economy, it also comprises only a small part of the fishing-related economy. The U.S. National Marine Fisheries Service notes that the U.S. West Coast longline, gillnet and other fishing for highly migratory species (such as tuna and swordfish) make up only a small portion of overall fisheries-related business in most ports and communities. This is true even in southern California, where the bulk of the industrial longline vessels were located until the Hawaiian swordfish

longline fishery was reopened in spring 2004. Of California's 90 seafood processors in 1995, only five processed significant quantities of swordfish.[31]

Extensive bycatch by longline vessels has significant, negative consequences for recreational fishing and other industries that rely on a healthy marine ecosystem. Marine wildlife tourism generates many times more revenues from non-extractive activities, such as visits to intact marine habitats. Whale watching has grown quite rapidly. In 1991, about 4 million people in 31 countries watching whales and other cetaceans generated $317.9 million. This grew rapidly to 5.4 million people in 64 countries only three years later in 1994, generating $504.3 million.[32] The value of ocean-related recreation in small regions can rival the estimated $4-$5 billion value of the global longline industry. According to the U.S. Commission on Ocean Policy, "In just four South Florida coastal counties, recreational diving, fishing, and ocean-watching activities generate $4.4 billion in local sales and almost $2 billion in local income annually."[33]

MPAs are proven to also contribute significantly to local economies. In Hawaii, which the report singles out for attention, "the annual recreational value of the coral reefs of each of six Marine Management Areas in the Hawaiian Islands in 2003 ranged from $300,000 to $35 million."[34]

Regional contributions to the U.S. economy made by recreational fishing are equal to the global value of the longline industry. Recreational fishing in California generates $2.9 billion in sales, $5 billion in personal income and $5.7 billion in value added to the economy. It is estimated that 153,849 people are employed in the state in jobs related to recreational fishing while only 20,820 are employed in commercial fishing. In Hawaii, the value of recreational fishing far exceeds the estimated $47.4 million value of the longline industry.[35] Recreational fishing trip-related expenditures were estimated to range from $130-$347 million in 1995-1996.[36] In the U.S. as a whole, saltwater recreational fishing generates $30.5 billion and nearly 350,000 jobs.[37]

Industrial longline fishing damages not only stocks of billfish, it also impacts existing and potential ecotourism revenues based on healthy marine ecosystems. Many of the small coastal and island nations that rely on meager access fees from longline fishing averaging 2-5.5 percent are ironically destroying the very marine ecosystem that offers a longer-term and less volatile source of revenue.[38]

IV. The Social and Cultural Costs of Longlining

In November 2001, the European Council recognized that the access of foreign fleets to the waters of developing coastal and island nations threatened widespread social and economic consequences for the employment and food security of local populations that exceed the fees paid by the foreign user. The council explicitly "notes with concern that many developing countries are

experiencing problems related to decreasing catches, while supply of fish is vital for their food security and their economic development."[39]

Access agreements present a triple threat to local communities. The agreements often result in the depletion of fish stocks, limited fishing access to hereditary fishing areas, and damage to the marine ecosystem. First, such agreements threaten local food security and employment as fish become increasingly scarce. Second, access agreements threaten the ability of local communities to generate future revenues from tourism because fewer visitors will come to an environmentally degraded destination. Finally, the cultural survival of local communities is threatened as a result of the loss of marine biodiversity that is at the center of many of their worldviews and spiritual beliefs.

Island Nations Are Left Holding the Line

As we have seen, a healthy marine ecosystem has more to offer in terms of long-term revenue generation than unregulated and unsustainable exploitation of predatory species. Yet, even the $2 billion regional tuna market has little to offer island nations other than meager access fees, depleted near shore fisheries and loss of a cultural way of life that is interdependent on fish, sea turtles and cetacean species that are being caught and killed on longlines.

Access agreements signed by Pacific island nations in the region have only earned them 2-5.5 percent royalties of the $2 billion regional annual tuna market.[40] While these fees comprise a large part of their national budget, about 20 percent for Tuvalu for example, they represent only a tiny fraction of an extremely lucrative market.[41] In total, "fourteen Pacific island countries shared U.S. $79.3 million (less than 4 percent) towards their GDPs from locally based offshore fishing vessels in 1999."[42] This is a short-term pay-off as many of the vessels that are now fishing in this region have arrived after destroying their own and African fisheries. The rapid increase in this problem is evidenced by the fact that the number of registered vessels in the South Pacific increased about 50 percent between 1997/98 and 2001/02.[43]

These access agreements perpetuate the economic and ecological impacts created by government subsidies of the fishing industry. In addition to the EU access agreements that have been signed in recent years, a 1987 treaty between 16 Pacific island nations and the U.S. granted access to their EEZ to as many as 50 vessels. The U.S. government subsidizes $14 million of the annual $18 million payment.[44]

One factor that has accelerated the number of access agreements is the industry's response to conservation efforts in their home countries. When conservation efforts are successful in closing vast swaths of territorial waters to destructive fishing in order to stimulate a recovery of depleted or exhausted fish stocks, the same vessels that caused the overfishing crisis will use government subsidies to relocate to other fisheries or even the waters of poor developing

nations, shifting the problem abroad far from public oversight and scrutiny. What is happening in the South Pacific is only the latest chapter in a repeating cycle of the global pillaging of our shared ocean.

The access agreement problem is compounded when island nations lack the resources to regulate and enforce the agreements. With very few onboard observers, incomplete Vessel Monitoring Systems and limited oversight by flag governments, these nations have no way to verify reported catches or tackle rampant IUU (illegal, unregulated and unreported) fishing which is estimated to be 5-15 percent of the reported catch.[45]

To address the problems of low access fees, absence of catch limits, IUU fishing, and the lack of reporting, observers and regulation, the new Western and Central Pacific Fisheries Convention took effect in June 2004. Unfortunately, some of the largest longlining nations including Japan, the U.S., China, Taiwan and South Korea have yet to accede.

This array of problems underlies an emerging conflict that threatens the survival of these island nations, global food security and our fragile marine ecosystem. Because 80-95 percent of the coastal marine harvest in U.S. colonies of American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (worth a total of $1-$2 million each) are collected for home consumption, these fisheries provide both a source of employment and an inexpensive food source for the local population that is being put at risk by overcapacity by foreign and domestic industrial fleets.

As reports of declining catches near shore are emerging, many on these islands are faced with a Faustian choice between declining opportunities for subsistence fishing and relatively lucrative access agreements. According to the Associated Press, "That money is needed and that dilemma is felt on scores of islands across the Pacific, the vast setting for what may become one of the great battles between consumption and conservation in the 21st century, as a growing appetite for fish meets oceans fast being emptied of them."[46]

V. The Impact on Small-Scale Artisanal Fishing

The impact on local "artisanal" fishermen and women is nowhere better illustrated than in the Western and Central Pacific where an estimated 10 percent of the total tuna catch is taken by vessels based in the region.[47] The net result of access agreements is a net outflow of resources and employment that is being repeated in many other regions of the world.

Industrial longline fishing also threatens the jobs, and in some cases the nutritional subsistence, of artisanal, subsistence and other small-scale fishers, who represent 90 percent of the world's fishermen and women, and who are responsible for almost 50 percent of total world landings.[48] Near-shore waters long used for subsistence fishing, which account for an estimated 95 percent of world fish catch

(80 million tons), are becoming an increasingly contested terrain that will determine the food security for about 20 percent of the human population. Because worldwide fishing and fishing-related industries employ approximately 400 million people and another 1 billion rely on fish for a significant source of protein, wasteful fishing practices can have significant multiplier effects. Declining catches over the past decade have cost about 100,000 jobs among the world's 15-21 million fishers and the "cost of fish in some local marketplaces has risen dramatically, placing fish out-of-reach for many low income consumers."[49]

The UN Secretary-General's report on oceans and the law of the sea and fisheries (A/60/63) identified a series of threats posed by foreign industrial fishing to small-scale near-shore artisanal fisheries in its discussion of fisheries and their contribution to sustainable development. The report warned that "many fisheries conducted in areas under national jurisdiction, including small-scale fisheries, are facing difficulties relating to local excess fishing capacity, unauthorized incursions by foreign fleets in violation of the sovereign rights of the coastal State under articles 56, 61 and 62 of UNCLOS, ecosystem degradation, undervaluation of catch, excessive by-catches and discards, and increasing competition between artisanal and large-scale fishing, and between fishing and other types of activities. Absence of control in the overall fishing effort and fishing practices of local fishers and foreign fishing vessels, prompted by the inadequacy of monitoring, control and surveillance, is the root cause of such unsustainable fishing practices. These practices are believed to have adverse effects on the sustainable development and conservation of fishery resources, economies and food security of coastal States, particularly developing coastal States."[50]

Reports of declining, small-scale, near-shore artisanal fisheries throughout the Pacific are on the rise. A number of small Pacific island nations, including Fiji, Kiribati and Samoa, have reported that subsistence catches are on the decline.[51]

Traditional fisheries are rapidly being depleted as local laws are changed to commercialize publicly owned fisheries for the benefit of large industrial vessels. In the Philippines, one study by Pamalakaya (the National Federation of Fisherfolk Organizations in the Philippines) identified changes in the Philippine Fisheries Code that "facilitate the entry of commercial fishing boats into municipal grounds that should be reserved for small fishermen."[52] Economic liberalization has resulted in overfishing, an increase in cheap imported fish and the entry of Taiwanese longline vessels in Philippine waters all of which threaten to make fish inaccessible to the local population and destroy fish stocks relied on by local handline tuna fishers.[53] Similar cases of drastically lower catches have also been reported in other areas of the Western and Central Pacific.[54]

In Chile, artisanal fisheries received only 2 percent of the quota in the horse mackerel fishery, too little to maintain current fishing effort when "individual non-transferable quotas" were created in 2001. The impact on local food security was

severe since horse mackerel is an important source of local food. Horse mackerel is used by the industrial fishery as feed for animals that are exported abroad as meat.[55]

Likewise, the impact to local fishing communities and consumers in importing countries can also have serious consequences. Cheap imports can drive out local producers, as is happening with the U.S. shrimp industry, which is threatened by cheap imported aquaculture shrimp from Asia and Latin America. The cheap imports can replace a locally or even sustainably produced product (such as Alaskan salmon) with lower quality fish, invasive species, toxics and genetically modified species.

In many parts of the Pacific, local people rely on seafood for their livelihoods and as important sources of protein. In the U.S. Pacific islands, for example, 80 to 95 percent of the coastal marine harvests in American Samoa, Guam and the Commonwealth of the Northern Mariana Islands are collected for home consumption. These fisheries provide both a source of employment and an inexpensive food source for the local population. At the same time, Pago Pago, American Samoa, and Agana, Guam, are the first ($211.8 million in 1996) and fourth ($94.2 million in 1996) largest U.S. ports in terms of ex-vessel value of commercial fishery landings by domestic and foreign vessels. Much of the fish is tuna transhipped from the South Pacific region on its way to the U.S. market.[56]

A. The Impact on Island Cultures

Many of the island nations of the Western and Central Pacific have developed unique cultures interwoven with the ocean, fish and other living creatures that are crucial to their self-awareness of their place in the world, their origins, spirituality and unique socio-economic subsistence-based ways of life. The rapid depletion of not only large predatory fish but also associated species, such as sea turtles and cetaceans, by industrial longline fishing threaten the very existence of their ways of life.

Writer Osha Gray Davidson relates that a number of island cultures trace their origins to the sea turtle. Hawaiian spiritual teachers relate the creation myth of the sea turtle as "the benevolent character who inhabits the spiritual world and the physical world at the same time. It is the link between the two. Turtle is the foundation." Likewise, in Samoa the belief that the islands float upon the backs of giant sea turtles goes back many generations; in China many place the entire universe on the back of the sea turtle, and the people of Tokelau and Bora Bora believe their peoples were carried to one another's island on the back of a sea turtle. At the core of these beliefs are traditions that allowed sea turtles to be consumed as food but prevented them from being depleted. Even the capture of sea turtles as food required that they be shared by the entire community under threat of prohibitions for violating community norms.[57]

These legends are not merely myths. Rather, they define cultural rules that have allowed these island societies to live in harmony with the ocean and its living

beings, a harmony now threatened by longline fishing that may contribute to government coffers at the cost of emptying the people's plates. With declining catches by small-scale fishing communities on many of these islands who are finding it increasingly difficult to continue subsistence fishing, the survival of these communities and their ancient cultures are at stake.

B. The Threat to Public Health

Longlining threatens the survival of artisanal and subsistence fishing communities, large predatory fish stocks, sea turtles, marine mammals and sea birds to provide seafood that is too dangerous to eat. In the U.S., Japan and the EU, widespread attention is being focused on the dangers to pregnant women and expectant and nursing mothers and their children from the consumption of methyl mercury, a dangerous neurotoxin found in high concentrations in predatory species that can damage the developing brains of fetuses and young children. Methyl mercury is formed in the ocean from mercury created by the burning of fossil fuels such as petroleum and coal in automobiles and power plants. Methyl mercury bio-accumulates up the marine food chain to create high concentrations in predatory species of fish such as shark, swordfish and tuna, as well as marine mammals such as whales, dolphins and porpoises.

A recent study by the U.S. Environmental Protection Agency found that about 630,000 children are born each year with enough methyl mercury in their blood to put them at risk of brain damage. This new estimate, in which one of every six women of childbearing age has enough methyl mercury in her blood to put her child at risk, doubled the previous calculation issued by the EPA. The U.S. Centers for Disease Control and Prevention, which collected the data, found that women who had eaten fish two or more times a week over the previous month had blood mercury levels seven times higher than women who had not eaten fish in the same period.[58] A recent study conducted in Finland and published in the journal of the American Heart Association has also linked mercury poisoning in male adults with increased coronary heart disease.[59] As awareness grows, levels of consumption of large predatory fish such as tuna and swordfish are dropping. In the six weeks after the U.S. Food and Drug Administration revised its mercury in fish warning, the sale of tuna fell by 9.3 percent. On March 19, 2004, the U.S. Environmental Protection Agency and the FDA revised their warning to pregnant women regarding tuna consumption. The warning advised that expectant, pregnant and nursing women and children should not eat any shark, swordfish or king mackerel due to high mercury levels. The advisory also included a caveat that women should eat no more than 12 ounces of light tuna a week and no more than six ounces a week of white tuna. A recent study found that 20 percent of consumers are "extremely" or "very" concerned about mercury in seafood, the third highest food-safety issue of concern in the U.S.[60]

The implication for Pacific island nations that rely on longline access fees is that consumption of these predatory species may continue to experience a decline in the U.S. as a result of health concerns and may soon do the same in the EU as more reports on the dangers emerge. The U.S. and EU are two of the largest global import markets for tuna. Because new EU rules allow testing imported fish for mercury levels and other contaminants, import restrictions and declining demands may soon result. Combined with declining predatory fish stocks, declining demand will have serious consequences for countries that rely too heavily on access fees from longlining.

VI. The Economics of Conservation

A number of recent studies have underscored the cost effectiveness of marine conservation relative to fishing subsidies that contribute to the economic damage caused by longline fishing.

A. Marine Protected Areas Are Cost Effective

Numerous countries use Marine Protected Areas (MPAs) to protect critical breeding grounds and migration routes for marine life. While MPAs are supported by extensive biological assessments—demonstrating their value in facilitating the recovery of threatened stocks, endangered species and damaged ecosystems to recovery—until recently there was little data demonstrating their effectiveness relative to fishing subsidies for the purpose of sustaining fish stocks.

Various types of MPAs that range from "sustainable use" to "no take" have been proven to effectively preserve endangered marine species and rapidly increase fish biomass by allowing fish to reproduce undisturbed. In most MPAs studied, biomass has doubled in just five years, while those in Kenya and South Africa have grown between 700-800 percent.[61] A recent study of 80 marine reserves found significant improvements in fisheries inside the reserves compared to the same area before the reserve was formed or areas outside the reserve. According to the authors of the report, "relative to reference sites, population densities were 91 percent higher, biomass was 192 percent higher, and average organism size and diversity were 20-30 percent higher in reserves" regardless of their size.[62] The authors conclude that marine reserves can make a significant positive contribution to the biological diversity of both target and non-target species in a relatively short period of time. "The establishment of marine reserves appears to result in significant increases in average levels of density, biomass, and likely diversity within 1-3 y [years], and these values persist through time," they conclude. "Because we analyzed data for target and non-target species, responses by larget species alone to reserve protection may be even more rapid and dramatic than our results indicate."

MPAs offer the added advantage over subsidized industrial fishing by creating regions where the recovery of fish stock and endangered species could take place for less than the cost of subsidizing the global industrial fisheries. A recent study of 83 MPAs worldwide found that conserving 20-30 per cent of the world's oceans would cost between $5-$19 billion annually and would create about 1 million new jobs to manage and protect them.[63] Global subsidies for industrial fishing are estimated to be between $14-$50 billion per year.[64]

Because MPAs are a proven cost effective way to increase fish stocks, they would be a crucial complement to a moratorium on industrial longline fishing in the Pacific. High seas MPAs would aid the recovery of depleted and overfished fish stocks thereby creating employment and ensuring food security for coastal communities. As we have seen above, many of these benefits would originate from sustainable use MPAs that would allow small-scale traditional fishing, recreational fishing and other tourism activities such as diving, snorkelling and wildlife viewing if they have a minimal impact on the ecosystem.

B. Saving Sea Turtles, Making Money

Reducing sea turtle mortality through reductions in longline bycatch would save money by reducing the need for costly, emergency sea turtle conservation efforts that are not calculated in the true costs of industrial fishing. Governments spend money on sea turtle conservation because of the role turtles play in maintaining healthy sea grass and coral reef ecosystems, reducing sponges and jellyfish, preserving the cultural and spiritual heritage of island and coastal communities, and attracting ecotourism. These efforts will continue to be undermined as long as the market fails to account for the economic costs to communities and countries from the destruction of sea turtles. Current spending on sea turtle conservation efforts is estimated at U.S. $20 million per year.[65]

A recent study documented the replacement cost of raising sea turtles in captivity rather than protecting them in their habitat. It has been estimated that the cost of raising one leatherback to maturity at the nursery in Rantau Abang, Malaysia over the course of 10 years would be $72,632. "Failure to reverse marine turtle decline would imply a replacement cost for nesting females through captive breeding estimated at U.S. $245.9 million–$263.3 million for green turtles and $2.5 billion for leatherback turtles. The cost of rearing turtles in captivity suggests that conservation of marine turtles in the wild is less expensive."[66] In effect, the necessary cost to recover the critically endangered leatherback sea turtle is equal to one-half the global annual revenue earned by longline fishing, the largest threat to its survival.

Sea turtles offer an ideal case study of the potential complementary relationship between conservation and sustainable development. Developing countries account for a striking 78-91 percent of the countries where five of the seven species of sea turtles live, and 61 percent of these countries are home to two

or more turtle species.[67] As a consequence of the global distribution of sea turtles, "the future of marine turtle populations and their potential to generate benefits to human societies depend mainly on policies implemented in countries with developing economies. These are the countries that stand to lose most from continued marine turtle decline. Conversely, developing countries would benefit most increasing sea turtle populations."[68]

These benefits are not insubstantial. "Non-consumptive use [of sea turtles] generates more revenue, has greater economic multiplying effects, greater potential for economic growth, creates more support for management, and generates proportionally more jobs, social development and employment opportunities for women than consumptive uses."[69]

For example, revenue from sea turtle tourism at the leatherback nesting beach at Playa Grande, Costa Rica, was $1,121,057 in 2002. Similarly, revenues were $2,113,176 at Leatherbacks National Park in 2001/2002.[70] The income earned by the residents of Gandoca, Costa Rica, from their conservation efforts amounted to $506 per leatherback turtle, $135.50 per nest and $1.70 per egg deposited on the beach. The cost of illegal fishing of green sea turtles in Costa Rica in 2000 was estimated to be $1,142 per turtle due to losses in visitors to nesting beaches and habitats when populations decline. Globally, the average gross revenue earned from locations where sea turtles were a major attraction for tourists was 2.9 times higher than areas where they were consumed as food.[71]

Malaysia, one of the first countries to encourage sea turtle tourism in the 1960s, provides an example of how unrestricted fishing can impact tourism revenues. In contrast to Costa Rica, which has made local conservation and international efforts at the 5th Informal Consultative Process of the UN Convention for the Law of the Sea in 2004 top priorities of sea turtle conservation, Malaysia has suffered heavy losses in sea turtle populations and tourism revenues. Although the fisheries sector in Malaysia employs only 1.5 percent of the total working population and tourism 6.2 percent, high levels of fisheries mortality led to rapid declines in leatherback sea turtles. The near-total extinction from 1994 to 2002 created a collapse in sea turtle tourism and revenues. If Malaysia had prevented the decline in the leatherback nesting population from the over-harvesting of eggs, it is estimated that gross revenue from tourism could have been 14 times its current amount, equivalent to $7,031,335 in 2002.[72]

Currently, there are 92 sea turtle nesting sites in 43 countries annually toured by 175,000 visitors. Because nature-oriented tourism is growing at 10-30 percent per year—far faster than the growth of general tourism at 4 percent annually—the potential benefits to developing countries with significant sea turtle populations is great.[73]

VII. Conclusion

Considering its total contribution to the economy and fishing industry, the destructive impact of industrial longline fishing on our oceans, fisheries, endangered species and government budgets cannot be justified. The threat to coastal communities, food security and irreplaceable biodiversity and natural resources, which are shared by all the nations and peoples of the earth, is too high a price to pay for the short-term profits of subsidized longline fishing. In contrast, high seas sustainable use MPAs offer a unique solution to rapidly restoring our depleted and threatened fisheries while creating much needed employment and revenues for coastal communities.

VIII. Recommendations for Action

Short-term Recommendations

- Implement a moratorium on high seas industrial longline fishing in the Pacific until such time that the species most threatened by longlining are out of danger
- Amend the UN Convention on the Law of the Sea Annex I to include all seven species of sea turtles
- Support further biological research to identify remaining critical habitat for endangered marine species
- Convene a UN special investigation of destructive fishing
- Ban the landing and transhipment of shark fins

Medium-term Recommendations

- Expand and strengthen enforcement and surveillance with special attention to IUU fishing
- Require longline fishing nations to release critical data
- Establish a global fund to assist developing nations in implementing sustainable fishing
- Require regional fisheries management organizations to require 100 percent observer coverage and the use of bycatch mitigation measures that minimize wildlife bycatch based on the best available science

Long-term Recommendations

- Create a Pacific-wide network of Marine Protected Areas on the high seas that allow sustainable artisanal and recreational fishing and tourism along known migratory, feeding and nesting habitats of threatened and endangered marine species
- Support sustainable small-scale fishing

Notes

[1] This backgrounder is an excerpt from the book *Striplining the Pacific: The Case for A United Nations Moratorium on High Seas Industrial Longline Fishing*, Sea Turtle Restoration Project, 2005, pp. 71-101, available at: www.seaturtles.org.

[2] See Manoa, P., Apps, L., and Q. Hanich, "Development without destruction: Towards sustainable Pacific fisheries," February, 2004, found at: http://www.greenpeace.org.au/oceans/pdfs/DWDReport_feb04.pdf.

[3] Sustainable use MPAs are defined as allowing uses such as small-scale artisanal fishing, recreational fishing, wildlife viewing, diving and snorkelling for example as long as they have minimal impact on the marine environment.

[4] Ovetz, R., Pillaging the Pacific: Pelagic Longline Fishing Captures or Kills About 4.4 Million Sharks, Billfish, Seabirds, Sea Turtles, and Marine Mammals Each Year in the Pacific Ocean, a report by the Sea Turtle Restoration Project, November 16, 2004. The bycatch data is extrapolated from reported Hawaiian longline bycatch by U.S. NOAA Fisheries. The phrase "catch or kill" is used because very little is known about post-hooking mortality. While some individuals may survive capture, too little is known to estimate how many will die later or be recaptured due to their injuries. According to one scientific study, "fisheries bycatch can result in direct mortality, but can also lead to delayed mortality or sublethal injuries, both of which are challenging to measure." (Lewison, R. et al, "Understanding impacts of fisheries bycatch on marine megafauna," Trends in Ecology and Evolution, vol. 19, no. 11, November 2004, p. 600.)

[5] Crowder, L., and R. Myers, First Annual Report To The Pew Charitable Trusts, A Comprehensive Study of the Ecological Impacts of the Worldwide Pelagic Longline Industry, December 31, 2001, p. xi; Lewison, R. et al., Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles, Ecology Letters, vol. 7, 2004, p. 221-231; and Spotila, J., et al., "Pacific leatherback turtles face extinction," Nature, vol. 405, June 1, 2000, pp. 529-530.

[6] Ward, P. and R. Myers, "Shifts in open-ocean fish communities coinciding with the commencement of commercial fishing," Ecology, vol. 86, no. 4, 2005, pp. 835–847. May 15, 2003, p. 280.

[7] Baum, J. and R. Myers, "Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico," Ecology Letters, 2004, vol. 7, p. 135–145.

[8] Myers, R. and B. Worm, "Rapid worldwide depletion of predatory fish communities," Nature, vol. 423.

[9] Lewison, R. and L. Crowder, "Estimating fishery bycatch and effects on a vulnerable seabird population" Ecological Applications, 2003, 13 (3), p. 748. Estimates of seabird bycatch may even be much higher for some species. A recent study found that when longline catch rates are adjusted for soak time to take into account that most seabirds are taken during deployment of longlines and fall off or are taken by predators before the line can be retrieved estimates of mortality of some seabird species would rise by as much as 45 percent. (Ward, P., R. Myers and W. Blanchard, "Fish lost at sea: the effect of soak time on pelagic longline catches," Fishery Bulletin, 2004, vol. 102, pp. 179–195.)

[10] BirdLife International, Threatened Birds of the World, CD-Rom, Cambridge, UK, 2004.

[11] M. Milazzo, Subsidies in World Fisheries: A Reexamination. World Bank Technical Paper No. 406. Washington: The World Bank, 1998:10, and 77-78.

[12] FAO, The State of Food and Agriculture 1993, Rome, 1993, p. 58.

[13] Ironically, the U.S. has obscured the costs of its own extensive range of fishing subsidies. See National Marine Fisheries Service, Federal Fisheries Investment Task Force Report to Congress, July 1999, available at: http://www.nmfs.noaa.gov/sfa/ITF.html; analysis of the Federal Fisheries Investment Task Force Report to Congress by fisheries economist C. Dumas, conversation with author, August 8, 2004; M. Earle, "Greens/Boell EU-US regional briefing on fisheries," prepared for the Green group in the European Parliament, Brussels, July 8, 2003, p. 1; and W. Broad and A. Revkin, " Has the sea given up its bounty?," The New York Times, July 29, 2003.

[14] Larsen, p. 99.

[15] A. Somma, "The environmental consequences and economic costs of depleting the oceans, Economic Perspectives: An Electronic Journal of the U.S. Department of State, "Overfishing: A global challenge," vol. 8, no. 1, January 2003, p. 15.

[16] Crowder, L., and R. Myers, A Comprehensive Study of the Ecological Impacts of the Worldwide Pelagic Longline Industry, 2001 First Annual Report to the Pew Charitable Trusts, draft, Philadelphia: Pew Charitable Trusts, December 3, 2001, p. xii, 112. In the Pacific, for example, bigeye tuna is listed as endangered by the IUCN.

[17] While accepted economic theory would argue that lower prices are good for consumers, it does not consider the "hidden" costs that accompany lower prices such as the health damaging effects of high levels of methyl mercury and the destruction of ocean marine resources.

[18] Hamilton, M., Curtis, R. and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," unpublished paper, SOEST 96-03, JIMAR Contribution 96-300, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 1996, p. 5 and 8; and Crowder, L. and R. Myers, p. 14.

[19] C. Dumas, The Economic Impacts of Banning U.S. Pelagic Longline Fishing, "Eastern Pacific (U.S. West Coast) Longline Fisheries," Chapter 2, unpublished research report, January 15, 2005, pp. 11 and 21.

[20] Porter, R. M., Wendt, M., Travis, M. D., and I.E. Strand, "Cost-earnings study of the Atlantic-based U.S. pelagic longline fleet," unpublished paper, SOEST 01-02, JIMAR Contribution 01-337, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 2001; and C. Dumas, "The economics of pelagic longline fishing in the U.S. and Canada—A brief overview," presentation notes submitted at the International Leatherback Survival Conference, April 22-25, 2002, p. 11.

[21] P. Tyedmers, "Fisheries and energy use", pre-publication draft, Cleveland, C. (ed.) Encyclopedia of Energy. Academic Press/Elsevier Science. vol. 2, 2004, p. 12.

[22] Ibid., p. 12.

[23] Dobrzynski, T., Gray, C., and M. Hirshfield, Oceans at Risk: Wasted Catch and the Destruction of Ocean Life—A Report by Oceana, 2002, p. 5.

[24] K. Hinman, Ocean Roulette: Conserving Swordfish, Sharks and Other Threatened Pelagic Fish in Longline-Infested Water, Virginia: National Coalition for Marine Conservation, February 1998, p. 8.

[25] For example, the U.S. agency NOAA Fisheries reopened the Hawaiian pelagic longline fishery in spring 2004 with mackerel bait, circle hooks and training in de-hooking sea turtles in place of closures. The swordfish fishery was closed and the tuna fishery subject to time-area closures due to high levels of sea turtle and sea bird bycatch. Although NOAA Fisheries has attempting to encourage other nations to implement these mitigation techniques, only one country, Ecuador, has agreed to do so. Unfortunately, NOAA Fisheries has agreed relax their new rules in response to

comments by the very longline fishermen who participated in the study of the techniques in the Atlantic that led to the reopening.

[26] Crowder, L. and R. Myers, p. 115.

[27] L. Dayto et al, "A global assessment of fisheries bycatch and discards," FAO Fisheries Technical Paper, No. 339, 1994.

[28] Hamilton, M., Curtis, R. and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," unpublished paper, SOEST 96-03, JIMAR Contribution 96-300, Pelagic Fisheries Research Program, Joint Institute for Marine and Atmospheric Research, University of Hawaii, Honolulu, HI, 1996, p. 1; and Tillman, M., "Director's report to the 51st tuna conference on tuna and tuna-related activities at the Southwest Fisheries Science Center for the Period May 1, 1999-April 30, 2000, Administrative Report LJ-00-05, May 2000.

[29] Crowder, L. and R. Myers, p. 17.

[30] C. Dumas, 2002, p. 5; and Asian Development Bank, "The role of tuna fisheries in the national economies," date unknown, available at: http://www.adb.org/Documents/Reports/Tuna/tuna08.pdf.

[31] Crowder, L. and R. Myers, p. 18.

[32] R. Constantine, "Effects of tourism on marine mammals in New Zealand," Science for Conservation, Department of Conservation, Wellington, New Zealand, No. 106, 1999, found at:http://www.doc.govt.nz/publications/004~science-and-research/Science-for-Conservation/PDF/sfc106.pdf.

[33] U.S. Commission on Ocean Policy, Chapter 9, "Managing coasts and their watersheds," Preliminary Report, 2004, p. 107.

[34] United Nations, Millennium Ecosystem Assessment Synthesis Report, Pre-publication Final Draft Approved by MA Board on March 23, 2005, A Report of the Millennium Ecosystem Assessment, p. 91.

[35] Hamilton, M., R. Curtis and M. Travis, "Cost-earning study of the Hawaii-based domestic longline fleet," SOEST 96-03, JIMAR Contribution 96-300, p. 1.

[36] Western Pacific Regional Fishery Management Council, "The value of the fisheries in the Western Pacific Regional Fishery Management Council's Area," July 1999, pp. 3, 6.

[37] See Steinbeck, S., Gentner, B., and J. Castle, Economic Importance of Marine Angler Expenditures in the United States, NOAA Professional Paper NMFS, No. 2, 2004. The American Sportfishing Association estimated that it generates $8.1 billion and 300,000 jobs in their report Sportfishing in America: Values of our Traditional Pastime, 2001, found at: http://www.asafishing.org/asa/statistics/economic_impact/economic_impact_table.html.

[38] For example, EU vessels pay South Pacific island nations $44 per tonne of fish caught. However, when the market price of these fish are included in the calculations of their value, the island nations earn as little as 2 percent per ton. See Manoa, P., L. Apps, and Q. Hanich, Development without destruction: Towards sustainable Pacific fisheries," Greenpeace, 2004, p. 13; and Western Pacific Fishery Management Council, "The Value of the fisheries in the Western Pacific Fishery Management Council's Area," July 1999, p. 7, found at: www.wpcouncil.org/documents/value.pdf.

[39] Unfortunately, the Council has yet to act on this concern when it applies to lucrative pelagic longline fisheries in the Western and Central Pacific where there is little to no regulation, data collection on bycatch, observers, and implementation of bycatch mitigation techniques. The Council still has not extended the much stricter rules applied to vessels in EU waters to this

region. Council Resolution on Fisheries and Combating Poverty. 8 November 2001; and M. Earle, "Comments on the EU-Senegal Fisheries Agreement 2002-2006," report to the European Parliament, November 3, 2002, p. 3.

[40] Asian Development Bank, "The role of tuna fisheries in the national economies," date unknown, available at: http://www.adb.org/Documents/Reports/Tuna/tuna08.pdf.

[41] C. Hanley, "Global appetite, islanders' poverty threaten tuna's vast last refuge," Associated Press, July 21, 2004.

[42] P. Manoa, et al, p. 12.

[43] Ibid., p. 13.

[44] This is part of the large picture of a lucrative trade that exceeds the value of coffee, bananas, tea, rubber and rice and totalled $20 billion in 1994. Globally, an estimated 50 percent of internationally traded fish originates from the waters of developing countries. See L. Speer, et al, Hook, Line and Sinking: The Crisis in Marine Fisheries, NY: NRDC, 1997, p. 95 and 126.

[45] Greenpeace, "New era in pacific fisheries management," press release, June 16, 2004, found at: http://greenpeace.org.au/media/oceans_details.php?site_id=9&news_id=1401.

[46] Access agreements have been linked to declines in the population of wildlife on land as well. Overfishing by foreign fleets in Ghana has been linked to an increase in the bush meat trade. According to one study, "a poor fish year means fish are too expensive or are unavailable for most people, and these people must turn to wildlife hunting and the sale of wildlife products as a way of securing food and income." As a result, researchers found a 76 percent decline in abundance of the 41 species they studied. See David McAlary, "Study links low West African fish supply to increased bush meat hunting," VOA News, November 11, 2004.

[47] Greenpeace, cf. 29.

[48] United Nations Environment Programme, "UNEP supports Earth dive initiative to boost protection of oceans and seas," July 27, 2004, found at: http://www.enn.com/direct/display-lease.asp?objid=D1D1366D000000FE00D0A8F24F47749B; and L. Speer L., et al, Hook, Line and Sinking: The Crisis in Marine Fisheries, NY: NRDC, 1997, p. 127.

[49] G. Porter, Fisheries Subsidies and Overfishing: Towards a Structured Discussion, UN Environment Programme, Economics and Trade Branch, 1999, p. vii.

[50] A/60/63, para. 212, as cited in Annex III-A, "United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, Sixth meeting, 6-10 June 2005," Advance and unedited text (English only), March 21, 2005, p. 8, A/AC.259/L.6.

[51] P. R. Gonzales, "Small island: a question of survival," World Conservation, vol. 1, 2004, p. 15; and P. Manoa, p. 14.

[52] J. Yu, "Fishing industry not safe from globalization net: Government policies favor foreign fishing interests and monopolies at the expense of the country's small fishermen and consumers," available online at: http://groups.yahoo.com/group/ibon.

[53] A. Estabillo, "20-T tuna handline fishers risk losing livelihood if...," Mindanao Times, 2003.

[54] Manoa, P., Apps, L., and Q. Hanich, "Development without destruction: Towards sustainable Pacific fisheries," February, 2004, found at: http://www.greenpeace.org.au/oceans/pdfs/DWDReport_feb04.pdf.

[55] B. O'Riordan, "The privatization process," Samudra, July 2002, p. 39.

[56] Western Pacific Regional Fishery Management Council, "The value of the fisheries in the Western Pacific Regional Fishery Management Council's Area," July 1999, p. 3-4.

[57] O. G. Davidson, "Turtle culture", draft unpublished chapter, Fire in the Turtle House: The Green Sea Turtle and the Fate of the Ocean, Public Affairs: NY, 2001.

[58] J. Lowy, "EPA raises estimate of newborns exposed to mercury," Scripps Howard News Service, February 4, 2004.

[59] J. K. Virtanen, et al, "Mercury, fish oils, and risk of acute coronary events and cardiovascular disease, coronary heart disease, and all-cause mortality in men in Eastern Finland," November 11, 2004; available at: http://atvb.ahajournals.org/cgi/content/abstract/25/1/228; and J. Kay, San Francisco Chronicle, "Mercury in fish poses heart risk for middle-aged men, study says," Tuesday, February 8, 2005; available at: http://sfgate.com/cgi-bin/article.cgi?file=/c/a/2005/02/08/MNGL8B7E921.DTL.

[60] Seafood Business, "Mercury fear rising," June 2004, p. 1.

[61] Pew Oceans Commission, America's Living Oceans: Charting a Course for Sea Change, Pew Oceans Commission, June 4, 2003, p. 32.

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United Nations A/AC.259/14

General Assembly

Distr.: General
25 April 2005

Original: English

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea
Sixth meeting
6-10 June 2005

The United Nations Environment Programme and the marine litter challenge

A short overview of activities of the United Nations Environment Programme related to addressing the problem of marine litter

Submitted by the United Nations Environment Programme, Regional Seas Programme*

Summary

The present document presents a short overview of the marine litter issue and is organized in the following sections: the problem; lost and abandoned fishing gear and related debris; relevant activities of the United Nations Environment Programme; an overview of activities of regional seas programmes on marine litter; and possible ways forward.

* The present document is submitted late because it was received after the deadline established by the Documents Management Section.

05-32231 (E) 190505

I. The problem

1. Marine litter is found in all sea areas of the world — not only in densely populated regions, but also in remote places far away from any obvious sources. Studies from various parts of the world have confirmed that marine litter is found everywhere in the marine and coastal environment, from the poles to the equator and from continental coastlines to small remote islands. Marine litter originates from many sources and has a wide spectrum of environmental, economic, safety, health and cultural impacts. Considering the very slow rate of degradation of most marine litter items, a continuous input of large quantities of marine litter will result in a gradual increase of litter in the coastal and marine environment. This negative trend has been confirmed by a number of studies in various regions.

2. Despite efforts made internationally, regionally, nationally and many times locally, there are indications that the marine litter problem keeps growing worse. As long as the input of non-degradable litter into the marine environment continues, the result will be increased quantities of marine litter in the coastal and marine environments. Deficiencies in the implementation and enforcement of existing international, regional and national regulations and standards that could improve the situation, combined with a lack of awareness among main stakeholders and the general public, are other major reasons that the marine litter problem not only persists but appears to be increasing worldwide.

Sources of marine litter

3. Marine litter comes from both sea-based sources and land-based sources and it is obvious that measures to reduce or prevent it in the marine and coastal environment have to be taken in many communities, as part of a large number of activities over a wide range of societal sectors, and by many individuals in many different circumstances. The main sea-based sources of marine litter are merchant shipping, ferries and cruise liners, fishing vessels (mainly as a source of abandoned or lost fishing gear), military fleets, research vessels, pleasure craft, offshore oil and gas platforms and aquaculture installations. The main land-based sources of marine litter are municipal landfills (waste dumps) located on the coast, riverine transport of waste from landfills and other sources, discharges of untreated municipal sewage and storm water, industrial facilities, medical waste and tourism (recreational visitors, beach goers).

Quantities

4. Owing to the lack of systematic and comprehensive surveys on the quantities of marine litter on both global and regional scales, only selected information from different parts of the world, collected through a literature search, can be presented here. In 1997, the United States Academy of Sciences estimated the total input of marine litter into the oceans, worldwide, at approximately 6.4 million tonnes per year, of which nearly 5.6 million tonnes were estimated to come from merchant shipping. According to other calculations, some 8 million items of marine litter have been estimated to enter oceans and seas every day, about 5 million of which (solid waste) are thrown overboard or lost from ships. Furthermore, it has been estimated that over 13,000 pieces of plastic litter are floating on every square kilometre (km) of ocean today. In 2002, in the central Pacific gyre, there were found to be six kilograms (kg) of plastic for every kilogram of plankton near the surface.

5. The Ocean Conservancy (a United States non-governmental organization) has been organizing every year in September International Coastal Clean-up campaigns. In 2002, over 390,000 volunteers in 100 countries took part in these campaigns. They removed marine litter from more than 21,000 km of coastline and waterways, collecting more than 6.2 million pieces of marine litter, weighing over 4,000 tonnes. Almost 58 per cent of the coastal marine litter found could be attributed to shoreline and recreational activities, such as beach-picnicking and general littering. Many other such clean-up operations are carried out every year by thousands of schoolchildren, volunteers and local authorities in a large number of countries in all parts of the world.

6. During one decade (1992-2002), over 73,000 m^3 of marine litter had been gathered on some 300 km of rocky shores on the Swedish west coasts (including thousands of islands and islets), i.e. the easternmost part of the North Sea. The average annual amount of litter cleaned up on those beaches is 6,000 to 8,000 m^3 (20-26 m^3 per km). Using figures from the North Sea and the waters around Australia, as well as from other places, it has been estimated that up to 70 per cent of the marine litter that enters the sea ends up on the seabed, whereas half of the remaining amount (i.e. 15 per cent) is found on beaches and the rest (another 15 per cent) floats on the water surface.

Effects of marine litter

7. Marine litter is an environmental, economic, health and aesthetic problem. It kills, injures and causes pain and suffering. It is a vicious killer of wildlife. Entanglement and ingestion are the primary kinds of direct damage to wildlife caused by it. Sea Life Surveys scientists estimate that globally, more than 1 million birds and 100,000 marine mammals and sea turtles die each year from entanglement in, or ingestion of, plastics. Other threats to the marine and coastal ecosystems from marine litter include smothering of the seabed and disturbance of habitats from mechanical beach cleaning. Plastic litter is increasingly believed to be a source of persistent toxic substances. Pieces of marine litter can also transport invasive species between seas. Medical and sanitary waste constitutes a health hazard and can seriously injure people. Every year, marine litter entails great economic costs and losses to people and communities around the world. It spoils, fouls and destroys the beauty of the sea and the coastal zone.

8. Damage to people, property and livelihoods caused by marine litter can be grouped into a number of general categories. These include damage to fisheries, fishing boats and gear, damage to cooling water intakes in power stations, contamination of beaches (requiring cleaning operations), contamination of commercial harbours and marinas (demanding cleaning operations) and contamination of coastal grazing land, causing injury to livestock. Problems with propeller fouling, blocked intake pipes and damaged drive shafts have been reported. According to two studies made in 1976 and 1978 in the Bering Sea and the Gulf of Alaska, 40 to 60 per cent of bottom trawls collected plastic and metal debris. Marine litter-related damage to people also includes safety risks at sea (demanding rescue services) owing, inter alia, to fouling of propellers, as well as damage to people's health (injuries, disease) from litter on beaches and in bathing water, including medical waste.

Costs and economic damage

9. Only a few economic assessments have been made of the costs and financial damage caused by marine litter to municipalities or to specific activities such as fisheries. In a report published by the Kommunenes Internasjonale Miljoorganisasjon, Local Authorities International Environmental Organisation (KIMO) based in Shetland, United Kingdom, it was estimated that the annual cleaning cost to 56 local communities in the United Kingdom was US$ 3.9 million. This cleaning campaign covered 900 km of the coastline and 10,000 tonnes of waste were collected. On the basis of this information it is easy to extrapolate that the cost for cleaning the coastlines of Europe or even the world would be enormous. Swedish municipalities on the country's west coast (facing the North Sea) spend an estimated $1.6 million on cleaning beaches each year (involving only about 3,600 km). In 1999, Orange County in California, United States of America, collected garbage every week from a six-mile (nearly 10 km) stretch of beach at a cost to taxpayers of $350,000. Other counties spent even more. About $12 million was spent in the Republic of Korea during 2003 on issues related to marine litter.

10. According to a KIMO report, the total cost of marine litter in Shetland (the islands in the extreme north-east of the United Kingdom), assuming that all parties affected were hit equally badly, could be in the range of $9.9 million per year. The cost to the fishing industry could be $8.7 million. Bearing in mind that the Shetland coastline represents only a fraction of the European total, the costs could run into billions of dollars if this approximation was extended to cover coastal communities throughout Europe. In a survey conducted in Newport, Oregon, United States of America, 58 per cent of the fishermen indicated that they had experienced vessel problems owing to plastic debris and incurred an average expense of $2,725 per vessel. Based on statistics of damage insurance for fishing vessels in Japan, the leading cause of engine damage is due to plastic at sea. Insurance companies estimate that a total of $50 million has been awarded for repairs from damage incurred by marine litter.

Challenges in preventing and combating marine litter

11. Marine litter is not an environmental problem that can be solved solely by means of legislation, law enforcement and technical solutions. It is also a cultural problem and has to be addressed as such, namely through efforts to change attitudes and behaviours, through management approaches and education and through involvement of all sectors and interests, including the public at large.

12. There is a need to differentiate between measures aimed at preventing marine litter at the source and measures taken to deal with marine litter once it is already present in the marine and coastal environment. Preventive measures include, inter alia, better waste management on land and at sea and education and awareness-raising activities to influence behaviours. Measures to deal with already existing marine litter include beach, water column and sea-bottom clean-up operations and projects to allow fishing vessels to leave ashore marine litter caught in fishing gear without having to pay any garbage fee (or even to encourage such collection of floating and suspending plastics).

13. Today, in many countries, there is a lack of appropriate management of waste, from the source where the waste is produced through to its final disposal or processing. However measures to reduce or prevent marine litter should be a part of

waste management in society as a whole. People who are "waste-wise" in general and who realize that waste is a common problem and not one that "someone else should take care of" will have the same responsible attitude that would eventually reduce marine litter. The first step in good waste management must begin with preventing waste from being generated — what is never produced does not have to be disposed of and cannot become marine litter. The second step is to collect waste that has already been generated and make sure it is being taken care of properly, either for reuse and recycling of materials and products (to the extent possible) or for disposal in a manner that is safe from an environmental and health point of view.

14. Marine litter should be included in global and regional agreements, action plans, initiatives and negotiations and in national legislation. It is also an issue that is connected to other marine environmental, economic and health problems, including the possible distribution of toxic substances, the destruction of marine habitats and biodiversity, and the transfer of invasive species.

15. Education, information and training are vital components in all efforts towards more waste-wise thinking in society as a whole. Education and training are needed for many sectors of society and the general public in order to raise awareness about everyone's responsibility to prevent marine pollution. Education on the sources and effects of marine litter and ways of reducing the problem at the source needs to be incorporated into curriculums at various levels in the educational sector.

16. A wide range of marine litter-related instruments already exist and actions are being taken at the global and regional levels. Nationally, a number of countries have taken comprehensive action to address the marine litter issues through legislation, enforcement of international agreements, providing reception facilities for ship-generated wastes, improving their waste management practices and supporting extensive beach clean-up activities, as well as information, education and public awareness programmes. Thus, much is already being done, though it is obviously not enough.

II. Lost and abandoned fishing gear and related debris

17. Lost or abandoned fishing gear is a significant and very persistent form of marine litter. It poses a threat to the marine environment, as well as to human life and activities. The United Nations Environment Programme (UNEP) Regional Seas Programme recognizes the immediate and direct interconnection between marine litter and lost and abandoned fishing gear and related debris. It also puts significant emphasis on the development of solutions on the basis of international and inter-agency cooperation within the framework of a broader marine litter initiative. UNEP considers the Food and Agriculture Organization of the United Nations (FAO) and its related Regional Fishery Bodies, with their long experience in the area of fisheries, as a significant element of this cooperative process on the issue.

18. Once discarded or lost, the fishing gear remains in the marine environment, with negative economic and environmental impacts. Lately, lost and abandoned fishing gear has increasingly become a worldwide "high-profile" nuisance. In the UNEP feasibility study on sustainable management of marine litter of 2004, it is reported that in 2002, the United States National Oceanic and Atmospheric Administration collected 107 tonnes of nets and lines and other fishing gear on the Pearl and Hermes Atoll (northern Hawaiian Islands) alone. In 2003, another 90

tonnes were found near that atoll and the Midway Islands. Other statistics or estimates on quantities are hard to find, but it is assumed that hundreds of thousands of tonnes (or even more) of undegradable fishing nets are abandoned or lost in the world's oceans every year.

19. Fishing gear can inflict lethal cuts and wounds on fish and marine wildlife. When wrapped around limbs and fins, it can cause circulation loss and amputation, especially as the animal grows. Of the different types of marine mammals, seals and sea lions are the most affected (particularly by entanglement). It is estimated that some 100,000 marine mammals die every year from entanglement or ingestion of fishing gear and related marine debris. According to the United States Marine Mammal Commission, 136 marine species have been reported in entanglement incidents in the wider United States area, including 6 species of sea turtles, 51 species of seabirds and 32 species of marine mammals (Marine Mammal Commission, 1996). Based on recent entanglement studies, estimates suggest that about 1,500 seals die from entanglement each year in Australia (Page et al., 2003).

20. Nearly a million seabirds are thought to die from entanglement or ingestion of floatable material each year. Seabirds are some of the most frequent victims of abandoned nets or longlines. In addition, lost or abandoned gear can continue trapping fish for a long period out of the fisherman's control. Such an uncontrolled, unproductive process is known as "ghost fishing". Quantifying the loss of marine resources owing to "ghost nets" is difficult, but several studies on static gears have shown it to be about 10 per cent of the target population. Ghost fishing, through lost or discarded nets and lost underwater traps, kills thousands of tonnes of fish that might otherwise have found their way to the market. An estimated $250 million in marketable lobster is lost each year from "ghost fishing".

21. Within the broader scope of marine litter, the problem of lost and abandoned fishing gear requires more specific and sectoral solutions. Possible remedies to the problem may include the following directions: (a) quantification and understanding of the problem; (b) recovery of lost gear; (c) reception and collection of used and old gear; (d) prevention through education and regulation; (e) development of compensation systems for fishermen returning used fishing gear; and (f) review of fishing gear materials and development of new technologies.

22. Putting prominent emphasis on the effort to address the issue of lost or abandoned fishing gear within the wider context of marine litter, the UNEP Regional Seas Programme can act as a platform for developing common regional objectives and promoting synergies and coordinated regional implementation. This already takes place through the relevant Multilateral Environmental Agreements, global and regional initiatives and United Nations agencies, such as the International Maritime Organization (IMO), the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the secretariat of the Basel Convention, FAO and the Regional Fishery Bodies, the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) and the UNEP Division of Technology, Industry and Economics, as well as other international actors. Marine litter (e.g. discarded fishing gear) could be one issue for strengthened cooperation between the FAO Regional Fishery Bodies and the UNEP Regional Seas Programme in various parts of the world.

III. Relevant activities of UNEP

23. UNEP and its Regional Seas Programme and the Global Programme of Action have been developing and implementing a number of activities on the management of marine litter.

24. In 2004, UNEP initiated a feasibility study on sustainable management of marine litter (see para. 18 above). The study is a major attempt on the part of the Regional Seas Programme to assess the need, as well as the benefits and the challenges of programmes or initiatives, for the reduction and management of marine litter and to assess the benefits of implementing such projects in particular regions. The document addresses the problem of marine litter, as well as the measures to prevent the problem, and contains an analysis of the situation and proposals for action. The main results of the UNEP feasibility study on marine litter were published as a separate document.

25. In view of the magnitude and the severity of the marine litter problem, and after a series of consultations with IMO, UNESCO/IOC, FAO, the Basel Convention secretariat, the Mediterranean Action Plan and internal consultations with the Global Programme of Action and the United Nations Environment Programme Division of Technology, Industry and Economies, UNEP is considering developing a broader approach to deal with marine litter. This approach would be based on regional activities (such as developing regional action plans) and on substantive cooperation with the other agencies.

26. A leaflet on marine litter, entitled "Tightening the noose", was also published recently by UNEP. As mentioned earlier, in order to address the global and transboundary problem of marine litter, an interdisciplinary, multisectoral and holistic approach should be taken. With a view to addressing the problem, the Regional Seas Programme is considering initiating a Global Environment Facility medium-sized project aimed to develop a broader, more comprehensive approach to the sustainable management of marine litter. This initiative would provide a platform for inter-agency cooperation and coordination of activities for the control and management of marine litter and derelict fishing gear as part of the project.

27. As marine litter is found in all sea areas of the world, this proposed project would concentrate first on pilot regions that are particularly affected. It would also try to develop a platform for cooperation and coordination of activities for the control and management of marine litter on a wider scale. Moreover, the project would establish the necessary regional foundations and the regional and national capacities, assisted by various United Nations agencies, to address the problem. The results of this project, through activities in pilot regions, will allow further development of inter-agency and trans-regional initiatives to address the global problem of marine litter.

28. Until such time as the Global Environment Facility medium-sized project is fully developed and implemented, the UNEP Regional Seas Programme is developing additional regional activities relevant to the sustainable management of marine litter in consultation and cooperation with other United Nations agencies. The aim of these activities is to "prepare the ground" for the development of the project in selected regions, the Mediterranean, the Caribbean, the Black Sea, the Northwest Pacific region and the South Asian Seas.

29. The sustainable management of marine litter is a perfect illustration of a global and transboundary marine environmental problem and for this reason it is anticipated that the United Nations system will be instrumental in tackling this global challenge.

IV. Overview of activities of regional seas programmes on marine litter

30. The following are reports received from individual regional seas programmes on their respective activities vis-à-vis the problems of marine litter and abandoned fishing gear.

Mediterranean Action Plan

31. Pollution caused by discharge of solid wastes and litter into the sea is a significant cause of degradation of both the land and marine coastal fringe in the Mediterranean.

32. The Programme for the Assessment and Control of Pollution in the Mediterranean Region (MED POL), the marine pollution assessment and control component of the Mediterranean Action Plan/Barcelona Convention, recently prepared an assessment of the situation related to coastal litter in the Mediterranean. The study shows that the major source of litter into the marine environment is from coastal urban centres owing to the lack of coastal solid waste management, to inadequate management or to the failure of such management. Coastal urban centres are generating annually 30 to 40 million tonnes of municipal solid waste. The generation of solid waste is estimated to be 254 kg per person yearly, with an annual generation growth of 2 to 3 per cent. The main source is direct disposal by households, followed by the impact of tourist facilities and run-off from waste dumps (waste from land sources). This means that, in fact, the majority of marine waste comes from coastal areas. The sources of marine waste vary from one country to another.

33. The main findings of the MED POL assessment of coastal litter in the Mediterranean are:

- Solid waste management in the coastal strips is generally not covered by the national environment policy
- Solid waste management policies in coastal strips are implemented under the national health policy
- Most coastal urban centres do not have a municipal policy for solid waste management
- The municipalities' strategy regarding solid wastes is to satisfy the public hygienic standards
- Municipalities are lacking qualified solid waste managers. The issue is much more evident in small and medium-sized urban centres
- Environment authorities lack reliable information on solid waste management issues. There are large gaps in the regional information system for solid waste management

- Decision makers are bombarded by contradictory information provided for purely commercial reasons. The two major sources of solid waste in the marine environment are urban centres (up to 75 per cent) and commercial and tourist activities
- For economic and technical consideration, it seems that the sea is still considered as the most common disposal site. Sea disposal of solid wastes is still a common practice for small and medium-sized urban centres
- Solid wastes reach the sea through a wash-out process from poorly located/ rehabilitated landfills.

On the basis of the assessment and the guidelines prepared, the MED POL Programme developed a pilot project for coastal litter management in a number of locations in Lebanon. The outputs and deliveries of this project will be used to replicate it elsewhere in Lebanon and in other Mediterranean cities. This project is jointly implemented by MED POL, local authorities, local non-governmental organizations (NGOs) and RAMOGE.

Northwest Pacific Action Plan

34. Marine litter has become an issue of concern in the Northwest Pacific region because it is linked to other marine environmental, economic, health and aesthetic problems, including possible transfer of toxic substances and invasive species, destruction of marine habitats and loss of biodiversity. The members of the Northwest Pacific Action Plan (NOWPAP) adopted a resolution at the Ninth Intergovernmental Meeting (Busan, Republic of Korea, 2-4 November 2004) to develop a joint initiative to prevent and reduce marine litter in the marine and coastal environment and its harmful and costly effects. In the NOWPAP region therefore the marine litter activity is presently at the development stage, with the aim of initiating work in 2005. The overall objective of the currently scheduled project is to seek sustainable management of marine litter in the NOWPAP region in line with the sources, quantities and adverse effects of marine litter. This information will be collected during the implementation stage in the biennium 2005-2007.

Caribbean Environment Programme

35. Currently, the Caribbean Regional Coordinating Unit within the Caribbean Environment Programme of UNEP does not have any specific national or regional projects that deal exclusively with marine litter. However, activities under the Assessment and Management of Environmental Pollution subprogramme (including the Land-based Sources of Marine Pollution Protocol) and those that promote the implementation of the Specially Protected Areas and Wildlife Protocol are directly related to marine litter. These include assessments of marine litter as a land-based pollutant and its impact on critical coastal and marine ecosystems.

36. In this context, the following ongoing and new initiatives are highlighted: (a) promotion of the integrated management of solid and hazardous wastes and an integrated life-cycle approach to the management of chemicals in the Wider Caribbean region; (b) Regional Network in Marine Science and Technology for the Caribbean; (c) second regional overview of land-based sources and activities in the Wider Caribbean region; (d) development of National Programmes of Action

Demonstration Projects; (e) International Coral Reef Action Network in the Wider Caribbean region; and (f) conservation and sustainable use of coastal and marine ecosystems.

37. Marine litter activities in many of the countries of the Wider Caribbean region and in particular for the small island developing States are limited to periodic beach clean-up and community clean-up exercises that are coordinated by local NGOs, schools, private sector organizations, dive associations, tourism authorities, hotels, solid waste management agencies, community groups, environmental departments, coastal zone agencies and/or departments of fisheries. These are often associated with commemorative events, such as National Clean-up Day, Earth Day and/or National Environment Day. Most of the countries commemorate and participate in activities as part of International Coastal Clean-up Day. Eighteen Caribbean countries and 10,472 persons took part in the 2003 international coastal clean-up.

38. The United States has a number of marine litter and debris activities. For example, both the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency work in close collaboration with State and local governments and NGOs to sponsor and participate in national and local beach clean-ups. Examples of such activities include: (a) in 2004, NOAA implemented a project in Puerto Rico to reduce marine debris caused by discarded fishing lines; (b) the International Coastal Clean-up is the largest volunteer environmental data-gathering effort and associated clean-up of coastal and underwater areas in the world. It takes place every year on the third Saturday in September. In 2001, over 140,000 people across the United States participated in the clean-up. They removed about 3.6 million pounds (1,600 tonnes) of debris from more than 7,700 miles (12,320 km) of coasts, shorelines and underwater sites; (c) the National Marine Debris Monitoring Program is designed to gather scientifically valid marine debris data following a rigorous statistical protocol. This scientific research is carried out every 28 days by teams of volunteers at randomly selected study sites along the United States coastline.

South Pacific Regional Environment Programme

39. Waste management is one of the major environmental issues within the Pacific region. Marine debris comes from both land and ship-based sources. All countries have activities in this field, including improving infrastructure, strengthening regulatory mechanisms, management procedures, raising awareness and education. These are undertaken as part of bilateral programmes or as internally funded national activities by national and local governments, the private sector and NGOs.

40. A number of regional programmes are being undertaken that address waste management, including the drafting of a regional waste management strategy and work programme, and community-based waste management projects as part of the International Waters Programme. Ship-based marine debris from commercial shipping has been addressed by assisting countries to put in place arrangements to manage ships' waste. A review of ships' waste management has been undertaken. The fishing industry is a major contributor to marine debris. The South Pacific Regional Environment Programme and Secretariat of the Pacific Community have collaborated in putting together and distributing awareness-raising materials. A training programme on marine environment protection was formulated and is used by the national Maritime Training and Fisheries Institutes in the region.

Regional Organization for the Protection of the Marine Environment (ROPME) — Kuwait Convention region

41. In the ROPME Sea Area (the Kuwait Convention region), litter is an increasing problem, generated from land, shore and ship-based activities. The waste from ship-based activities alone is estimated at 1.2 to 2.6 kg/person/day, most thrown overboard (Anbar, 1996). The coastline of the ROPME Sea Area is also being used as a repository for large quantities of industrial, commercial and residential trash and other solid waste. In the area, litter is found in the form of plastics, metal containers, wood, abandoned fishing gear, broken fishing nets, tyres and even entire automobiles in certain places. Oil sludge constitutes the most important type of solid waste in terms of quantity (Linden et al., 1990). Anthropogenic activities and accumulation of solid wastes (e.g. discarded fishing nets, traps, anchors, debris and tyres) can be a threat to the marine habitats, creating anoxic conditions for benthic fauna and having a negative impact throughout the marine ecosystem.

42. "Ghost fishing" by lost or abandoned fishing gear has been found in the ROPME region. Lost fishing nets and traps, as has been pointed out, can "ghost fish" for a long period. The negative impact of abandoned fishing nets, especially gill nets on coral reefs, is tremendous and has been recorded in the region (State of the Marine Environment Report, 2003). Discarded and abandoned fishing nets are catching and killing marine turtles. In the sea, the nets drown turtles. On nesting beaches, they entangle young ones (Ross, 1987). No regular regional or national scientific data is available on lost or discarded fishing gear. Nor is there any estimate of the loss to the economy owing to "ghost fishing".

V. Possible ways forward

43. The information gathered and analysis made within the framework of the UNEP Regional Seas feasibility study on sustainable management of marine litter demonstrates that marine litter, while currently addressed in a variety of contexts by a number of knowledgeable and efficient entities, continues to pose a serious threat to the environment and sustainable development. Strengthening and expanding the efforts of these entities (as discussed above) as they act in their respective global and regional contexts could greatly enhance their efforts to diminish the marine litter problem. Moreover, greater coordination and cooperation among them could be the most powerful means of ensuring that the battle against marine litter is waged in a comprehensive and effective manner.

44. There are a number of potential modalities for strengthening cooperation among the relevant entities (including United Nations bodies, conventions and agreements, national Governments, NGOs and others). Ad hoc and bilateral cooperative efforts can be effective, but a more streamlined approach, including a steering/coordinating committee, composed of United Nations agencies, Regional Seas Programmes and relevant representation of NGOs and private sector organizations, could also be used.

45. Such a committee could decide on priorities and coordinated activities, with all partners being responsible, jointly and individually, for the mobilization of funds and implementation of global, regional and sectoral activities. Activities could include: (a) information outreach and fund-raising; (b) building ownership and

partnerships; and (c) global, regional and national activities, as well as activities to be undertaken within specific relevant sectors.

46. UNEP GPA, IMO, FAO, the Basel Convention, IOC, Regional Seas Conventions and Action Plans and other concerned global and regional organizations as well as the numerous NGOs could all play an important role in such a coordinated attack on marine litter, given their varied and respective unique expertise and knowledge of different aspects of the matter.

47. Regardless of the structure of any coordinated action taken, a large number of potential actions to strengthen marine litter-related efforts have been identified by various expert organizations that were consulted during the compilation of the UNEP feasibility study, including, inter alia:

- Development of guidelines for management of marine litter at the regional and national levels
- Development of sectoral guidelines, e.g., guidelines for tourism, boating, diving, cruise lines, coastal construction and fisheries. Guidelines for marine excursion providers (diving, boating, recreational fisheries and wildlife watching)
- Development of "responsible citizenship" guidelines for different target audiences, in particular children and tourists. Practical demonstration through awareness-raising campaigns in selected destinations and with selected tourism companies
- Assessment of gaps and needs related to marine litter in selected regions and development of activities aimed at improving the situation. These could be used as pilot projects
- Assessment of the general effectiveness of annex V to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) (IMO)
- Assessment of the effectiveness of the implementation of the MARPOL 73/78 annex V Special Area provisions in the Mediterranean, the Wider Caribbean and the North Sea regions
- Evaluation of those parts of the FAO Code of Conduct for Responsible Fisheries that deal with lost or discarded fishing gear
- Evaluation of those parts of the FAO Code of Conduct for Responsible Fisheries that deal with management of wastes from fishing vessels that are included in annex V to MARPOL 73/78
- Inclusion of marine litter in global and regional environmental assessments
- Improvement of port reception facilities and better waste management
- Monitoring of compliance with no-dumping regulations for plastics
- Evaluation of a strategy for environmentally sound management of hazardous and other wastes, such as lead acid batteries and biomedical and health-care wastes, for impacts on the marine environment

- Increasing local planning and management capacity to avoid location of waste dump sites near coastlines or waterways or to prevent litter from escaping into the marine and coastal environment
- Formulation and implementation of improved solid waste management programmes in small rural communities to prevent litter from escaping into rivers and the marine and coastal environment
- Establishment of campaigns and/or permanent services for collecting solid wastes that pollute marine and coastal areas
- Long-term and well-designed research and monitoring programmes and studies in order to detect and determine statistically significant trends in the composition, quantities and effects of marine litter globally and regionally
- Support to organized beach surveys and beach clean-up activities by NGOs.

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United Nations A/AC.259/15

General Assembly

Distr.: General
2 June 2005

Original: English

United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea
Sixth meeting
6-10 June 2005

Note verbale dated 27 May 2005 from the Permanent Mission of Pakistan to the United Nations addressed to the Secretariat

The Permanent Mission of Pakistan presents its compliments to the United Nations Division for Ocean Affairs and the Law of the Sea and, with reference to the Division's letter dated 22 February 2005 regarding the sixth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, has the honour to enclose its inputs on the two areas of focus: (a) fisheries and their contribution to sustainable development; and (b) marine debris (see annex).

The Permanent Mission of Pakistan would be grateful if the present note and its annex would be issued as a document of the Consultative Process.

05-37159 (E) 030605

Annex to the note verbale dated 27 May 2005 from the Permanent Mission of Pakistan to the United Nations addressed to the Secretariat

Government of Pakistan, Ministry of Environment

I. Fisheries and their contribution to sustainable development

1. The fisheries sector in Pakistan makes a small but significant contribution to Pakistan's economy. The fisheries sector employs around 1 per cent of the civilian labour force, which is mostly unskilled. The major portion of the export earnings in this sector is from shrimp. Shrimp have been harvested without consideration of the life cycle stages needed in order to maintain sustainable yields. Owing to the rising level of effort, the catches per unit of effort (CPUE) have decreased considerably. The rest of the capture-fisheries subsector is characterized by the underutilization of existing stocks. Aquaculture (mariculture) is almost absent in Pakistan. As the majority of shrimp habitat areas in Pakistan are close to coastal villages, these areas remain the locus of small-scale fishing activities throughout the year. This continuous practice of small-scale fishing has affected Pakistan's shrimp habitats. We can overcome this problem by:

(a) Implementation of a two-month ban on catching shrimp;

(b) Alternate sources of income during these months;

(c) Promoting aquaculture (mariculture);

(d) Improving fishing skills.

Policies/measures that can be adopted to overcome fisheries problems

1. Use sea fisheries fully, bringing annual harvesting up to the limit of sustainable yields;

2. Protect and restore shrimp fishing habitats restricting harvesting to the level of annual sustainable yields;

3. Poverty reduction in fishermen communities;

4. Reducing pollution in marine water.

Measures

1. Use sea fisheries fully, bringing annual harvesting up to the limit of sustainable yields:

(a) Facilitate deep sea fishing;

(b) Stock assessment for better fisheries;

(c) Harvest fisheries on a sustainable yield basis;

(d) Protect fisheries against pollution.

2. Protect and restore shrimp fishing habitats restricting harvesting to the level of annual sustainable yields:

(a) Alternate sources of income;

(b) Declare marine protected areas;

(c) Harvest fisheries on a sustainable yield basis;

(d) Protect fisheries against pollution;

(e) Restoration/afforestation of the mangrove forest to compensate habitat loss;

(f) Advocate at the policy level for the release of maximum water downstream in order to avoid sea intrusion.

3. Poverty reduction in fishermen communities:

(a) Facilitate deep sea fishing;

(b) Alternate sources of income;

(c) Harvest fisheries on a sustainable yield basis;

(d) Enhance aquaculture (mariculture) activities;

(e) Poverty alleviation programmes involving fishermen in market economy from subsistence use;

(f) Improving health facilities;

(g) Improving nutrition.

4. Reducing pollution in marine water:

(a) Advocacy for maximum water supply to the sea to increase the dilution factor;

(b) Sewage treatment plants;

(c) Advocate with thermal companies for control of thermal pollution;

(d) Close link with port authorities for control of oil pollution;

(e) Awareness among the fisherfolk communities to reduce pollution from fishing boats.

II. Marine debris

2. Sources of marine debris are:

(a) Domestic sewage/waste from a city of more than 10 million people;

(b) About 45 per cent of Pakistan's industry (by value added) is located in Karachi;

(c) Waste from two ports (Karachi and Port Qasim) and four fishing harbours: Karachi port and harbour are the most heavily used areas and the greatest pollution is seen both from vessels and from the port's oil terminal;

(d) Wastes from steel mills, power plants and refineries.

3. Most of the toxic wastes of Karachi are dumped at sea. These toxic wastes are producing several problems, which are:

(a) Eutrophication caused by pollution from sewage (or other organic biodegradable such as fish processing wastes) through increasing overall biomass in the form of algal bloom has reduced economically important marine fauna;

(b) Thermal pollution;

(c) Increased turbidity;

(d) Siltation;

(e) Mangrove degradation;

(f) Health problems for the coastal communities.

4. If present trends continue, with no checks instituted, it is expected that the present zone of oxygen deficient bottom conditions in Karachi harbour will extend to cover most of the area and its backwaters. These conditions will slowly spread into the creeks, with serious consequences to marine bottom dwelling species and benthic fauna.

Policies/measures that can be adopted to overcome these problems:

Solid waste

1. Promote reuse and recycling by privatization of refuse collection;

2. Encourage marketing assistance for the effective use of scavenging systems.

Measures

- Develop an effective municipal garbage purchase mechanism at intermediate delivery points;
- Promote energy production from waste and composting plants by the private sector;
- Ensure proper sanitary landfill practices;
- Establish incentive and control systems.

Effluents

1. Adopt domestic water treatment technologies that provide for recovery and reuse of water, nutrients and organic matter in ways that are safe and profitable to the operator;

2. Focus the regulatory approach on industrial discharge, as these contain some of the toxic effluents;

3. Support the recovery and use of heavy metals from industrial effluents.

Measures

- Develop systems for safe sewage irrigation;
- Encourage source reduction, through recovery by industrial units of heavy metals before discharge;
- Establish legal, institutional and pricing systems to support these measures.